

Claims

We claim:

1.-A compass and communication system to transmit azimuth data to a remote location comprising:

a compass sensor module having:

a waterproof housing;

a mounting mechanism on said housing to engage a headgear worn by an operator;

a two-axis gimbal mechanism inside said waterproof housing, said two-axis gimbal mechanism having a protective housing connected to said waterproof housing, said protective housing containing ring structure and two orthogonal axis structures;

a magnetic field sensor unit mounted on one of said axis structures, said magnetic field sensor module providing magnetic field data signals representative of the direction faced by the operator, said mounting mechanism transmits horizontal yawing motions of the operator to said gimbal mechanism and said magnetic field sensor unit; and

a processor electronics section connected to said magnetic field sensor unit providing data signals representative of azimuth from said magnetic field data signals; and

a data transmission module having:

an electrically insulated conductor connected to said

25           compass  
26                    sensor module;  
27           an amplifier stage connected to said insulated conductor for  
28                    amplifying said azimuth data signals;  
29           an electrically insulated cable extending from said  
30   amplifier  
31                    stage for remotely transmitting said azimuth signals  
32                    thereon; and  
33           a transceiver/display console at a remote location connected  
34                    to said cable to receive and display said remotely  
35                    transmitted azimuth data signals.

1   2.-The system of claim 1 further comprising:

2           an RF transmitter in said compass sensor module coupled to  
3   receive  
4                    said azimuth signals and transmit them in RF form and  
5           an RF receiver in said data transmission module to receive said  
6   RF  
7                    form of said azimuth signals and couple them to said  
8                    amplifier stage.

1   3.-The system of claim 2 further comprising:

2           an acoustic transducer in said data transmission module being  
3                    connected to said amplifier stage to transmit said azimuth  
4                    data signals as acoustic signals through ambient water to  
5                    said remote location.

1 4.-The system of claim 3 wherein said acoustic transducer is an  
2 acoustic transceiver/transducer, said operator is a diver in water,  
3 said transceiver/display console is at said remote location on a  
4 surface craft, and said acoustic transducer/transceiver communicates  
5 acoustic signals through said water between said diver and said craft.

1 5.-The system of claim 4 further comprising:  
2 a battery for supplying electrical power in said waterproof  
3 housing;  
4 a switch in said protective housing having a push-button  
5 extending  
6 through said waterproof housing, said push button connecting  
7 said processor electronics section to said battery to turn-  
8 on said compass sensor module; and  
9 an antenna on said console for relaying said azimuth data.

1 6. The system of claim 5 further comprising:  
2 an RF transceiver having a microphone/speaker in said compass  
3 sensor module connected to said conductor to permit voice  
4 communications between said diver and said craft.

1 7. The system of claim 6 further comprising:  
2 a counterweight connected to the bottom of said magnetic field  
3 sensor unit; and  
4 a fluid filling said protective housing around said magnetic

5 field

6 sensor unit.

1 8. The compass system of claim 7 wherein said counterweight hangs on  
2 rigid attachment from said magnetic field sensor unit to help keep it  
3 level and prevent oscillations by pitching and rolling motions of said  
4 diver, and said fluid dampens movement of said magnetic field sensor  
5 unit to allow said diver a wide range of pitch and roll motion without  
6 degrading the accuracy of said magnetic field sensor unit.

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1 9. A system for generating and communicating azimuth data  
2 representative of heading of an operator to a remote location  
3 comprising:

4 means for providing a waterproof housing;

5 means for engaging a headgear worn by an operator, said engaging

6 means being mounted on said waterproof housing providing

7 means;

8 means for securing a two-axis gimbal mechanism inside said

9 waterproof housing providing means, said two-axis gimbal

10 mechanism creating means having a protective housing

11 connected to said waterproof housing providing means, said

12 protective housing containing ring structure and two

13 orthogonal axis structures;

14 means for sensing magnetic fields mounted on one of said axis

15 structures, said magnetic field sensing means providing

16 magnetic field data signals representative of the direction

17           faced by the operator;  
18       means for processing data having a processor electronics  
19           section connected to said magnetic field sensing means for  
20           providing data signals representative of azimuth from said  
21           magnetic field data signals;  
22       means for providing an electrically insulated conductor being  
23           connected to said processing data means;  
24       means connected to said insulated conductor means for  
25           amplifying an electromagnetic form of said azimuth data  
26           signals;  
27       means extending from said amplifying means for remotely  
28           transmitting said electromagnetic azimuth data signals on an  
29           insulated cable; and  
30       means coupled to said insulated cable for receiving and  
31       displaying  
32           said remotely transmitted electromagnetic azimuth data  
33           signals at a remote location.

1   10. The system of claim 9 further comprising  
2       means coupled to receive said azimuth data signals from said  
3           processing means for transmitting them in RF form;  
4       means for receiving said RF form of said azimuth data signals and  
5           coupling them to said amplifying means;  
6       means coupled to said amplifying means for transmitting said  
7           azimuth data signals as representative electromagnetic  
8           signals through water; and

1 means coupled to said amplifying means for transmitting said  
2 azimuth data signals as representative acoustic signals  
3 through water.

1 11.-A method of sensing azimuth and communicating data representative  
2 direction faced by a diver in water comprising the steps of:  
3 providing a compass sensor module having a waterproof housing;  
4 engaging a headgear worn by an diver by a mounting mechanism on  
5 said waterproof housing to position said compass sensor  
6 module on the back of the head of said diver;  
7 securing a two-axis gimbal mechanism inside said waterproof  
8 housing of said compass sensor module, said two-axis gimbal  
9 mechanism having a protective housing connected to said  
10 waterproof housing, said protective housing containing ring  
11 structure and two orthogonal axis structures;  
12 sensing magnetic fields representative of the direction faced by  
13 said diver by a magnetic field sensor unit mounted on one of  
14 said axis structures, said magnetic field sensor unit  
15 providing magnetic field data signals representative of the  
16 direction faced by said diver;  
17 providing azimuth data signals from said magnetic field data  
18 signals by a processor electronics section in said compass  
19 sensor module;  
20 coupling said azimuth data signals over a conductor to an  
21 amplifier stage of a data transmission module;  
22 transmitting said azimuth data signals as electromagnetic

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1            signals on an insulated cable of said data transmission  
2            module to a surface craft at a remote location;  
3            transmitting said azimuth data signals as acoustic signals  
4 through  
5            said water; and  
6            displaying said transmitted azimuth data signals at said remote  
7            location on a console.